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Advances and Obstacles in Biomedical Therapies for Mental Health Disorders

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ABSTRACT

Biomedical therapies encompass physiological interventions aimed at alleviating symptoms of psychological disorders, based on the assumption that biological factors contribute to these conditions. The primary treatment methods include psychopharmacology and electroconvulsive therapy (ECT). Psychotropic medications, such as anti-anxiety drugs, anti-psychotics, anti-depressants, and mood stabilizers, have revolutionized mental health treatment, offering relief to millions. However, concerns over side effects, dependency, overprescription, and long-term efficacy persist. ECT, once widely used, remains a controversial yet potentially effective treatment for severe depression. While biomedical therapies have significantly advanced psychiatric care, ongoing research and ethical considerations highlight the need for a balanced approach, integrating both pharmacological and psychosocial interventions. This review article has been compiled to summarize various biomedical therapies used to improve the mental health along with the limitations and side effects.

Keywords: Biomedical Therapies, Psychopharmacology, Mental Health Treatment, Antianxiety Drugs, Antipsychotic Drugs, Antidepressants

Introduction

The treatment of psychological disorders is greatly aided by biomedical therapies and their tools which deal with its physiological aspects (Deacon et al 2013). These therapies operate under the assumption that mental disorders have at least partial biological origins, thus making medical treatment a necessity for proper symptom relief. With the emergence of new technology, various medications including anti-anxiety drugs, anti-psychotics, anti-depressants, and mood stabilizers have become common due to improved patient outcomes. Furthermore, electroconvulsive therapy (ECT) remains a key alternative treatment for severe, non-responsive depression (Gay et al 2021).

Along with the advantages, biomedical therapies have many drawbacks. Any positive

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results from psychotropic medication are always contentious, because unlike the relief, the primary illness is never treated. Dependency, potential adverse effects, and too frequent prescriptions constitute the problem. While ECT is helpful for certain conditions, it is not without risk, especially regarding cognitive function and memory. Understanding the balance between the positive impacts versus the negative sociocultural impacts of these treatments is vital (Waite et al 2013).

Biomedical Therapies

Physiological interventions known as biomedical therapies are used to lessen the symptoms of psychiatric problems. These treatments make the assumption that bodily dysfunctions are at least partially to blame for psychological problems (Bendelow et al 2009). There are undoubtedly benefits to this notion for a variety of illnesses, particularly more severe ones.

Treatment with Drugs

Antianxiety, antipsychotics, antidepressants, and mood stabilizers are the four primary categories of therapeutic medications used to treat mental illnesses. For all four drug classes, the number of prescriptions written by psychiatrists has risen since the mid-1990s (Safer et al 1997).

Antianxiety Drugs

Anxiolytics ease nervousness, tension, and trepidation. The most widely used of these drugs are Xanax and Valium, which are trade names for the generic versions of alprazolam and diazepam, respectively (Leaman et al 1992). Valium, Xanax, and other similar medications are often called tranquilizers. These drugs exert their effects almost immediately. They can be quite effective in relieving feelings of anxiety. However, its effects are measured in hours, so its impact is relatively brief. Anxiolytics are routinely recommended to persons with anxiety disorders, but they are also given to millions of people who simply complain of persistent nervous tension (Panday et al 2024).

Every drug used to treat psychiatric illnesses has potentially harmful side effects that some patients experience but others do not. Sleepiness, lightheadedness, cottony mouth, depression, nausea, and constipation are the most frequent adverse effects of Xanax and Valium (Ashton et al 1984). Although these hazards may have been overstated, these medications also carry the risk of abuse, drug dependence, and

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overdose. Another disadvantage is that when anxiolytics are stopped, patients who have been taking them for a long time frequently have unpleasant withdrawal symptoms.

Antipsychotic Drugs

Antipsychotic medications are primarily used to treat schizophrenia. They are also administered to individuals who develop delusions due to severe mood disorders (Lally et al 2015). Conventional first-generation antipsychotics seem to reduce dopamine synaptic activation. But the precise connection between them. Its therapeutic effects and neurochemical effects are still unknown.

Research indicates that antipsychotic medications, albeit to differing degrees, lessen psychotic symptoms in about 70% of patients. The effects of good antipsychotic medications appear gradually. Research by Cole, Goldberg, and Davis (1966) demonstrates how, in contrast to a placebo drug, patients' symptom levels gradually dropped following treatment with three distinct antipsychotics (Davis et al 1978). Within two to seven days, patients typically start to show improvement. After a few months, there might be more advancement. Since antipsychotics can lower the risk of relapsing into an active schizophrenic episode, many individuals with schizophrenia are prescribed them forever.

Antipsychotic medications unquestionably play a major role in the treatment of severe mental illnesses. Antipsychotic medications do, however, have drawbacks (Mossman et al 2002). They have a lot of negative impacts. Cotton mouth, constipation, and drowsiness are typical. There may also be tremors, rigidity in the muscles, and poor coordination. Due to adverse effects, many patients who have been prescribed antipsychotics stop taking them after being released from the hospital. Regretfully, over 70% of patients relapse within a year after stopping antipsychotic drugs.

Psychiatrists now mostly use second-generation antipsychotic medications, a more recent family of antipsychotic medicines. In terms of therapeutic efficacy, these medications appear to be comparable to first-generation antipsychotics, although they have a number of benefits. Naturally, they have hazards, just like any other potent medication: second-generation antipsychotics seem to make patients more susceptible to cardiovascular issues and diabetes (Holt et al 2019).

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Antidepressant Drugs

Antidepressant drugs, as their name implies, assist people overcome depression by progressively elevating their mood (Table 1) summarized from the Galvin, 2020. As the most often prescribed class of medication in the United States, antidepressants are tied with anti-cholesterol medications, and dependence on these drugs has grown significantly in recent years (Dunn et al 2012). While providing comparable therapeutic advantages in the treatment of depression, modern antidepressants have less unpleasant or harmful side effects than their predecessors. SSRIs have adverse effects, even though they are less problematic than earlier antidepressants. Among the potential side effects are agitation, weight gain, nausea, drowsiness, sexual difficulties, feelings of emotional numbness, and an increase in suicide thoughts. Because of their versatility, SSRIs can be used to treat a wide range of anxiety disorders.

Similar to antipsychotic medications, various antidepressants work gradually over several weeks, although the first two weeks are often when 60% of patients see improvement (Weiden et al 1997). According to a review of studies that closely looked at how severe a patient's depression was when they started taking antidepressants, those with severe depression benefit from them the most, while those with mild to moderate depression seem to benefit from them only slightly. Evidence from various researches suggesting that SSRIs may raise the risk of suicide, particularly in teens and young adults, has been a major worry in recent years (McCain et al 2009).

It is far more difficult than one may think to gather conclusive data on this topic. The main issue is that individuals with the conditions for whom SSRIs are recommended already have high rates of suicide. The findings of the research on this subject are complex and conflicting. According to a well-known meta-analysis, antidepressants marginally raise the likelihood of suicidal thoughts and actions. An additional review of 41 antidepressant medication studies, however, did not uncover a higher risk of suicide. The importance of any increased risk in the first month after using antidepressants is obscured by the fact that another study indicated that the risk of suicide is already very high among young people in the month prior to starting antidepressants (Simon et al 2006).

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This pattern has sparked worries that well-meaning cautions might have backfired and increased the number of untreated suicides. The dose level given may be a crucial factor, according to a large-scale study. According to this study, adolescents and young adults who began taking an antidepressant at a dose greater than the modal (normal) dose had around double the likelihood of self-harming behaviors compared to those on lower doses.

It is obvious that the dangers of delivering antidepressants to children must be balanced against the dangers of not doing so. In the end, this is a complicated matter, but experts generally concur that parents and physicians should keep a close eye on teenagers who begin using SSRIs (Karp et al.,2007).

Table 1: ***Examples of the antidepressant belong to different Classes and their mode of actions with adverse effects.***

Examples of Antidepressant	Class to Belong	Mechanism of Action	Reported adverse effects
Sertraline, paroxetine, fluvoxamine, fluoxetine, escitalopram, and citalopram	Selective serotonin reuptake inhibitors (SSRIs)	Block the brain's reabsorption of serotonin, which is often the medication that medical experts use to treat depression.	Withdrawal symptoms, headache, sleepiness, insomnia, agitation, dizziness, decreased sexual desire, effect on appetite, and drug interactions
Selegiline, isocarboxazid, phenelzine, tranylcypromine, moclobemide, and iproniazid	Monoamine-oxidase inhibitor (MAOIs)	Reduce the activity of monoamine oxidase enzymes to manage social anxiety, panic attacks, and	Symptoms of withdrawal, weight gain, fatigue, sleeplessness, headaches, dry

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		depression.	mouth, nausea, and decreased sexual desire
Desvenlafaxine, venlafaxine, levomilnacipran, duloxetine, and milnacipran	Serotonin-norepinephrine reuptake inhibitors (SNRIs)	Several mental health conditions, such as severe depression and anxiety disorders, can be treated by blocking the brain's reabsorption of serotonin and norepinephrine.	Constipation, headache, dizziness, nausea, dry mouth, increased perspiration, decreased sexual drive, decreased appetite, medication interactions, and withdrawal symptoms
Amitriptyline, nortriptyline, clomipramine, desipramine, and imipramine	Tricyclics	Block the brain's reabsorption of serotonin and norepinephrine, but they have more negative side effects than SSRIs or SNRIs.	Sleepiness, impaired vision, dry lips, constipation, tremor, fluctuating weight, decreased desire for sex, medication interactions, and withdrawal symptoms

Mood Stabilizers

Mood stabilizers are drugs that help people with bipolar mood disorders manage their mood fluctuations. Lithium and valproate are the primary medications in this class (Altamura et al 2011). Both have been proven to be helpful in keeping bipolar individuals from experiencing mania and depression in the future. Additionally, they

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can be used to help bipolar individuals stop their present manic or depressed episodes. On the down side, if lithium use is not properly controlled, it might have some harmful side effects. Because high amounts of lithium can be harmful and even lethal, the patient's blood lithium levels need to be closely watched. Lithium medication is also linked to serious issues with the kidneys and thyroid.

Evaluating Drug Therapies

For many patients, particularly those with severe conditions that frequently resist treatment, pharmacological therapy can yield evident therapeutic advantages. Pharmacological treatments are debatable, though (Sanders et al 2020). Numerous concerns have been brought forward by critics. First, some detractors contend that medication treatments frequently have transient and superficial therapeutic effects and are not as successful as claimed. For instance, Valium only temporarily relieves an unpleasant sensation; it doesn't actually address anxiety issues. Additionally, when treatment regimens are stopped, relapse rates are high. Second, many patients are overmedicated, according to opponents, and many medications are overprescribed.

This line of criticism is supported by a study of psychiatrists' office visits, which revealed that despite the fact that little is known about the interactions between psychiatric medications, psychiatrists are increasingly prescribing two or even three medications to their patients (Ciraulo et al 2006). Additionally, the delivery of information and behavioral treatments has been weakened by the growing reliance on drugs. The medicalization of psychiatric diseases has resulted in a decrease in the use of psychosocial interventions, which can be just as safe and successful as pharmacological therapies, despite the fact that there has never been more empirical evidence for the benefits of behavioral therapy and insight.

Third, some detractors assert that psychiatrists tend to understate the negative side effects of therapeutic medications, which frequently outweigh the illnesses the medications are meant to treat (Paris et al 2010). This analysis was supported by evidence from research that tracked individuals with serious depression for nine years. Antidepressant drugs may have minor long-term side effects, as evidenced by the fact that those who had received medicine at age 9 showed higher levels of depressed symptoms than those who had not.

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Nowadays, the pharmaceutical business has attractive financial arrangements with the majority of experts that study the dangers and benefits of medications and create treatment guidelines. Pharmaceutical firms support their research, and they frequently get large consultancy fees (Choudhry et al 2002). Unfortunately, studies supported by pharmaceutical firms are far less likely to publish negative outcomes than studies funded by nonprofits, suggesting that these financial relationships compromise the objectivity needed in scientific study.

Additionally, industry-funded drug trials are sometimes too brief to identify long-term hazards linked to novel medications. Additionally, data about pharmaceuticals that show beneficial benefits are nearly always publicized, whereas data showing negative results are frequently not (Goldacre et al 2014). Moreover, research designs and results reports are frequently skewed in a number of ways to highlight the advantages and downplay the disadvantages of the drugs in question.

Electroconvulsive Therapy (ECT)

Ladislas von Meduna, a Hungarian psychiatrist, conjectured in the 1930s that schizophrenia and epilepsy could not coexist in the same body. These seizures were first caused by a medicine. However, two Italian psychiatrists demonstrated in 1938 that using an electric shock to induce seizures was a safer method. As a result, contemporary electroconvulsive therapy emerged (Shorter et al 2007).

Electrical shocks are used in the biomedical treatment known as electroconvulsive therapy (ECT). To reduce the risk of complications, including spinal fractures, the patient is given a range of medicines and light anesthesia. After that, an electric current is applied for a brief period of time. The patient typically loses consciousness during a brief convulsive attack (5 to 20 seconds) brought on by the current. Usually, the patient awakens within an hour or two (Gibbs et al 1968).

Over a few weeks, people usually receive two to three treatments each week, with a typical course of treatment lasting six to twelve sessions. Major depressive disorder is found in 85% of ECT patients. Though its use has been decreasing, ECT is still a common treatment today. The number of patients receiving ECT treatment fell by 43% during that time. In the United States, however, an estimated 100,000 people are treated with ECT each year (Trivedi et al 2021). Proponents of ECT contend that the public's widespread misunderstanding of its dangers and adverse

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effects is the reason it is underutilized.

According to Charles Kellner, a geriatric psychiatrist, "it is very likely that three to five times as many people with mental illness will need to receive ECT." Since ECT was presented in the well-known 1975 movie One Flew over the Cuckoo's Nest in a highly unfavorable and wildly erroneous manner, Kellner (2011) contends that it has been unjustly maligned by critics.

Effectiveness of ECT

There are several ways to interpret the data about ECT's therapeutic effectiveness. However, success rates may be significantly lower in community hospitals with less treatment experience. They also point out that ECT can be beneficial for older patients, that it can lower short-term (30-day) hospital readmission rates, and that many patients who do not respond well to antidepressant drugs frequently get better after receiving it (Owusu et al 2022). Patients who have ECT and recover from their depression without relapsing report significant increases in their quality of life.Regretfully, following ECT, relapse rates might be substantial over the long term. But because ECT is primarily used for people with severe persistent depression who have not responded to medication therapy, these significant recurrence rates might happen. In other words, large rates of relapse are to be predicted if ECT is only utilized in the most challenging patients.

Risks Associated with ECT

Even proponents of electroconvulsive therapy acknowledge that short-term adverse effects of the treatment frequently include memory loss, focus problems, and other cognitive impairments (Zinn et al 1999). According to proponents of ECT, these cognitive impairments are often moderate and go away in a few months. Evidence, however, indicates that some individuals may experience severe memory impairments as a result of ECT. According to a well-known analysis of the data, ECT frequently causes retrograde amnesia for autobiographical knowledge, which can result in memory loss that is both chronic and occasionally irreversible.

For than 30 years, the FDA, which oversees medical devices in the US, has been deeply involved in a contentious discussion about how to regulate ECT (Powell et al 2018). When ECT is used with patients who have been diagnosed with depressive disorders and have been demonstrated to be resistant to medication

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therapy or who need a quick response to treatment because of the severity of their disease, the FDA ultimately issued an order in December 2018 downgrading the risk rating of ECT (Flueckiger et al 2018). Additionally, the ruling mandates that patients be given more thorough information on the potential side effects of ECT.

Conclusion

Biomedical therapies have significantly transformed the treatment of psychological disorders, providing relief to individuals suffering from conditions such as anxiety, depression, schizophrenia, and bipolar disorder. Psychopharmacological interventions, including antianxiety drugs, antipsychotics, antidepressants, and mood stabilizers, have proven effective in managing symptoms and improving patients' quality of life. Additionally, electroconvulsive therapy (ECT) remains a valuable option for treatment-resistant depression, despite ongoing controversies regarding its long-term effects. However, the reliance on biomedical therapies is accompanied by challenges, including potential side effects, dependency risks, and concerns about overprescription. Critics argue that these treatments often focus on symptom management rather than addressing the root causes of mental illness, raising ethical and medical concerns. Furthermore, the influence of the pharmaceutical industry on research and clinical practice has sparked debates about the objectivity of drug efficacy studies. While biomedical therapies play a crucial role in psychiatric care, they should be integrated with psychosocial interventions to provide a comprehensive and holistic approach to mental health treatment. Continued research, ethical oversight, and individualized treatment plans are essential to ensuring that these therapies maximize benefits while minimizing risks. As the field of mental health evolves, a balanced combination of medical and therapeutic approaches will be key to advancing patient care and improving long-term outcomes.

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